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Apr 27, 1993

DERWENT-ACC-NO: 1993-172678

DERWENT-WEEK: 200116

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TITLE: Prodn. of hygroscopic composite for desiccant or packing material - by applying aq. soln. of monomer, crosslinking agent and deliquescent inorganic salt to fibrous material, and polymerising

## PATENT-ASSIGNEE:

ASSIGNEE

NIPPON SHOKUBAI CO LTD

CODE

JAPC

PRIORITY-DATA: 1991JP-0269380 (October 17, 1991)

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## APPLICATION-DATA:

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ABSTRACTED-PUB-NO: JP 05105705A

## BASIC-ABSTRACT:

The prodn. comprises applying (1) aq. liq. contg. (A) water-soluble unsatd. monomers, (B) crosslinking agents and (C) deliquescent inorganic salts to (2) fibrous bases; and polymerising (1).

(A) pref. contain carboxy amide or sulphonic acid (salt) gps. e.g. (meth)acrylic acid, (meth)acrylamide. (B) pref. contain at least 2 polymerisable double bonds. (C) are pref. MgCl<sub>2</sub> or CaCl<sub>2</sub>. The wt. ratios of (B) and (C) used are 0.0001-10 and 10-1000 per 100 of (A). The amt. of (1) applied is 10-1000 pts. per 100 pts. of (2) (e.g. woven and unwoven cloth).

USE/ADVANTAGE - The prods. are used as desiccants and hygroscopic packing materials. They absorb moisture rapidly in large amt.. They are produced simply at

low cost. The composites absorb moisture without liquefying. They can be used repeatedly after drying.

In an example, a monomer aq. liq. comprising 80 pts. (wt.) of 37 % sodium acrylate aq. soln., 8 pts. of acrylic acid, 0.007 pt. of methylene bisacrylamide, 125 pts. of aq. 30% MgCl<sub>2</sub> soln. and 0.5 pt. of sodium persulphate was applied to 23 g/m<sup>2</sup> of polypropylene unwoven cloth in a solid amt. of 34 g/m<sup>2</sup>. the monomers were polymerised at 120 deg. C. Then, a hygroscopic composite (basis wt. 57 g/m<sup>2</sup>) was obtd.. 1.0g of the composite was exposed to an atmos. of 25 deg. C/RH 90 %. It absorbed 0.90 g of moisture 1 hr. later, 1.33 g of moisture 2 hrs. later and 1.91 g of moisture in 10 hrs..

CHOSEN-DRAWING: Dwg.0/0

TITLE-TERMS: PRODUCE HYGROSCOPIC COMPOSITE DESICCATE PACK MATERIAL APPLY AQUEOUS SOLUTION MONOMER CROSSLINK AGENT DELIQUESCENT INORGANIC SALT FIBRE MATERIAL POLYMERISE

DERWENT-CLASS: A14 A92

CPI-CODES: A08-M10; A09-A; A11-B05C; A12-B02;

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0629 1061 1062 1123 1124 1130 1131 1137 1138 1179 1180 1200 1201 1215 2029 2066  
2116 2122 2123 2318 2386 2427 2432 2434 2435 2528 2723 2724 2733 2791 2820 3152  
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129 130 134 15& 174 264 266 27& 28& 316 355 381 398 402 408 409 431 438 440 441 477  
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- 3.In the drawings, any words are not translated.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the process of hygroscopic complex.

[0002]

[Description of the Prior Art] Conventionally, inorganic compounds, such as a calcium chloride and silica gel, are used as matter which has hygroscopicity. Especially, a calcium chloride is cheap, and since moisture absorption capacity is large, it is used widely. However, in order that a calcium chloride might liquefy according to moisture absorption, it fell, or soiled other things and there were many inconvenient things.

[0003] Although the desiccant of the organic system represented on the other hand by the so-called absorptivity resin was also proposed, and absorptivity was so high that this thing became, the hygroscopicity in a low humidity ambient atmosphere was not able to be used not as a satisfaction \*\*\*\* thing but as a drying agent.

[0004] Furthermore, although the method of mixing powder-like absorptivity resin, water soluble resin, and calcium chloride powder was also proposed recently, the moisture absorption rate of the former was slow and the latter had the problem that liquid sagging happened.

[0005]

[Problem(s) to be Solved by the Invention] This invention solves the above-mentioned trouble. Therefore, the purpose of this invention is to offer the approach of manufacturing easily the hygroscopic complex which does not have liquid sagging, was excellent in the moisture absorption property, and was excellent also in the working characteristic.

[0006]

[The means and operation] for solving a trouble this invention persons reached [ that the new hygroscopic complex which suits the above-mentioned purpose can be manufactured, and ] header this invention by performing the polymerization of this monomer, after giving the aqueous liquid which comes to contain a water-soluble partial saturation monomer, a cross linking agent, and deliquescent mineral salt to the fibrous base material, as a result of repeating examination wholeheartedly that the above-mentioned trouble should be solved.

[0007] That is, this invention is the process of the hygroscopic complex characterized by the thing which gave the aqueous liquid which comes to contain a water-soluble partial saturation monomer, a cross linking agent, and deliquescent mineral salt to the fibrous base material, and to postpolymerize.

[0008] As a water-soluble partial saturation monomer used by this invention The monomer which has carboxyl groups, such as an acrylic acid and a maleic anhydride; (meta) Acrylic-acid sodium salt, (Meta) Acrylic-acid potassium salt, acrylic-acid (meta) ammonium salt, (Meta) The monomer which has the carboxyl group of the form of salts, such as maleic-acid sodium salt; A vinyl sulfonic acid, The monomer which has sulfonic groups, such as a styrene sulfonic acid and acrylic-acid (meta) sulfopropyl; A sodium vinylsulfonate salt, The monomer which has sulfonates, such as a vinyl sulfonic-acid monomethylamine salt and acrylic-acid (meta) sulfopropyl sodium salt; (meta) Acrylic-acid hydroxyethyl, The monomer which has hydroxyl groups, such as acrylic-acid hydroxypropyl; (meta) Acrylic-acid ethylene glycol monomethyl ether, (Meta) The monomer which has ether groups, such as an acrylic-acid trioxyethylene glycol; (meta) Acrylic-acid dimethylaminoethyl, (Meta) The monomer which has amino groups, such as an acrylic-acid diethylaminoethyl; N and N'-dimethyl acrylamide, (Meta) Acrylamide, N-vinyl pyrrolidone, (Meta) The monomer which has amide groups, such as N-methylol-ized acrylamide; N, N', the monomer that has quaternary ammonium base, such as N"-trimethyl-N-(meta) AKURIRO yloxy ethyl ammonium chloride, can be mentioned. The monomer which has amide groups, such as monomer; N-N'-dimethyl acrylamide which has the carboxyl group of the form of salts, such as monomer; (meta) acrylic-acid sodium salt which has carboxyl groups, such as an acrylic acid (meta) and a maleic anhydride, preferably, acrylic-acid (meta) potassium salt, acrylic-acid (meta) ammonium salt, and maleic-acid sodium salt, acrylamide (meta), N-vinyl pyrrolidone, and N-methylol-ized acrylamide; it is the monomer which has a sulfonic-acid (salt) radical.

[0009] As a cross linking agent, ethylene glycol, trimethylol propane, a glycerol, Polyoxy ethylene glycol, II of polyols, such as polyoxy propylene glycol or tree (meta) acrylic ester; -- partial saturation, such as said polyols, maleic acid, etc., -- bis-acrylamide; tetra-ant ROKISHI ethane, such as unsaturated polyester;N [ which acids are made to react and is obtained ], and N'-methylene-bis-acrylamide, and a triaryl amine -- Allyl compounds, such as an arylation cellulose; although the G or tree (meta) acrylic ester etc. which poly epoxide and an acrylic acid (meta) are made to react, and is obtained is mentioned Depending on the case, bifunctional compounds, calcium hydroxides, etc., such as methylol-ized (meta) acrylamide, glyoxal, ethylene glycol, and ethylene glycol diglycidyl ether, can be used. It is the cross linking agent which has at least two desirable polymerization nature double bonds in which said water-soluble partial saturation monomer and copolymerization are possible.

[0010] The deliquescent mineral salt used in this invention can put an inorganic salt with the water vapor pressure of the saturated water solution smaller than an atmospheric steam partial pressure, and halogenides, such as chlorides, such as calcium, magnesium, a lithium, zinc, aluminum, and tin, a bromide, and an iodide, can specifically be mentioned. A magnesium chloride and a calcium chloride can use it suitably from the point of a price and moisture absorption capacity especially.

[0011] The range of a cross linking agent of 10-1000 is [ the weight rate of a water-soluble partial saturation monomer, a cross linking agent, and deliquescent mineral salt / 0.0001-10, and deliquescent mineral salt ] desirable, although especially the presentation of the water-soluble partial saturation monomer in this invention, a cross linking agent, and deliquescent mineral salt is not limited to the water-soluble partial saturation monomer 100.

[0012] As a fibrous base material used in this invention, they are the thing which specifically comes to fabricate fiber, for example, putt, carding or the web that carried out air lei DINGU, paper, a string, textile fabrics like cotton gauze, jersey, or a nonwoven fabric. as the material used -- any, such as synthetic fibers, such as natural fibers, such as wood pulp, polyester, and polyolefine, and an inorganic fiber, -- although -- it is usable.

[0013] The hygroscopic complex of this invention can be obtained by performing the postpolymerisation which gave the aquosity liquid which comes to contain said water-soluble partial saturation monomer, a cross linking agent, and deliquescent mineral salt to this fibrous base material. As

long as distributed maintenance of the monomer is carried out into a fibrous base material at homogeneity, and it carries out a polymerization as an approach of giving the aqueous liquid containing a monomer to a fibrous base material and it gets, it can be based on the means thru/or mode of pertinent arbitration. or [ that one of the typical approaches for that infiltrates aqueous liquid into a fibrous base material ] -- or it is the approach of spraying. In addition, as a solvent used for aqueous liquid, a hydrophilic organic solvent may carry out little \*\*\*\* in addition to water. Although there is no limit especially about the ratio of aqueous liquid and a fibrous base material, it is usually the range of the ten to aqueous liquid 1000 section to the fibrous base material 100 section.

[0014] How for what kind of approach learned from the former about the polymerization of said water-soluble partial saturation monomer to be sufficient as the polymerization method of aqueous liquid including the water-soluble partial saturation monomer, the cross linking agent, and the deliquescent mineral salt which were given to the fibrous base material, for example, irradiate a radiation, an electron ray, ultraviolet rays, etc.; the approach of carrying out a polymerization using radical polymerization initiators, such as a hydrogen peroxide and ammonium persulfate, etc. is mentioned. The approach of irradiating a radiation, an electron ray, ultraviolet rays, etc. and carrying out a polymerization is good by the usual approach. Moreover, especially the approach of carrying out a polymerization using a radical polymerization initiator is not limited, either, for example, although temperature changes with classes of initiator to be used, it is usually preferably good at 20-100 degrees C 10-150 degrees C. The polymerization initiator of a redox system can also usually use the amount of initiators. It is also possible to make an initiator contain in aqueous liquid beforehand, and to carry out adding after mixing at the time of a polymerization.

[0015] Thus, as for the obtained hygroscopic complex, it is common to dry with the means of hot blast, microwave, infrared radiation, etc. the obtained hygroscopic complex -- further -- a deodorant, preservation from decay and an antifungal agent, an aromatic, a coloring agent, etc. -- the time of a polymerization -- or it can add after a polymerization and can also consider as the hygroscopic complex of this invention.

[0016] A thermoplastics sheet layer, a binder layer, a nonwoven fabric layer, paper, etc. can be stuck at least on one side of the hygroscopic complex obtained depending on the case by various approaches.

[0017] The hygroscopic complex obtained by the approach of this invention

can be effectively used in a sitting-room, a closet, a wooden-clogs box, and shoes in the middle class of a locker, and a location to dehumidify. Moreover, since the resin which has superabsorbency is united with the fibrous base material by the polymerization, it excels in handling and workability. Since there is no fear of the moisture absorption rate not only having the early excellent moisture absorption capacity, but liquefying after moisture absorption remarkably, packing of the goods which dislike moisture absorption, such as a paste and a rice cracker, and are sold to the well-closed container, and the equipment which dislikes rusting etc. is used for the food and the industrial use articles which were using silica gel conventionally, and more powerful effectiveness is demonstrated. Furthermore, the hygroscopic complex of this invention is repeatedly usable, without losing early moisture absorption capacity by drying after moisture absorption.

[0018] Although an example is given and this invention is explained still more concretely hereafter, this invention is not limited to this. The section in an example and the example of a comparison and % are based on weight.

[0019]

[Example 1] The monomer aqueous liquid which consists of the 37% acrylic-acid sodium water-solution 80 section, the acrylic-acid 8 section, the methylenebis acrylamide 0.007 section, the 30% magnesium chloride water-solution 125 section, and the sodium persulfate 0.5 section was made to adhere so that the amount of solid content may become the basis weight of 23g/the polypropylene nonwoven fabric of m<sup>2</sup> with 34 g/m<sup>2</sup>, the polymerization was performed at 120 degrees C, and the hygroscopic complex (1) of this invention whose basis weight is 57 g/m<sup>2</sup> was obtained.

[0020]

[Example 2] The monomer aqueous liquid which consists of the 37% acrylic-acid sodium water-solution 40 section, the acrylic-acid 4 section, the ethylene-glycol-diacrylate 0.64 section, the 30% magnesium chloride water-solution 100 section, the hydroxyethyl cellulose 0.6 section, and the sodium persulfate 0.5 section was made to adhere so that the amount of solid content may become the flameproof paper of basis-weight 76 g/m<sup>2</sup> with 34 g/m<sup>2</sup>, the polymerization was performed at 120 degrees C, and the hygroscopic complex (2) of this invention whose basis weight is 110 g/m<sup>2</sup> was obtained.

[0021]

[Example 3] the hygroscopic complex (1) of this invention obtained in the example 1 and the example 2, and (2) -- every 1.0g -- respectively -- 500ml glassware -- putting in -- the constant temperature of 25 degrees C and 90% of

relative humidity -- it was left in the constant humidity chamber, weight augend was measured with time, and the amount of moisture absorption was investigated. The moisture absorption condition of this result and 10 hours after is shown in Table 1. In addition, as a blank, the result only in the case of a magnesium chloride and silica gel was also written together to Table 1. The hygroscopic complex of this invention is excellent in a moisture absorption rate and the amount of moisture absorption, and does not have liquid sagging after moisture absorption so that clearly from Table 1.

[0022]

[Example 4] When the binder layer was prepared in one side of the hygroscopic complex (1) of this invention obtained in the example 1 judged to 30cmx30cm and having been stuck on the dew condensation area of the wall of the apartment north side, dew condensation of the part has been prevented.

[0023]

[Table 1]

	吸湿量 (g)			吸湿後の 状態
	1 時間後	2 時間後	1 0 時間後	
実施例 1	0. 9 0	1. 3 3	1. 9 1	液だれなし
実施例 2	0. 7 2	0. 8 4	1. 3 3	液だれなし
シリカゲル	0. 4 4	0. 5 0	0. 5 0	粒子状
塩化マグネシウム	0. 5 9	0. 7 9	1. 7 0	液状

[0024]

[Effect of the Invention] This invention is the process of the hygroscopic complex characterized by the thing which gave the aquosity liquid which comes to contain a water-soluble partial saturation monomer, a cross linking agent, and deliquescent mineral salt to the fibrous base material, and to postpolymerize. There was no liquid sagging and the approach of this



invention enabled it to manufacture easily the hygroscopic complex excellent in the moisture absorption rate and the amount of moisture absorption. Therefore, according to the approach of this invention, the hygroscopic complex which has the following descriptions can be manufactured simple and cheaply.

[0025] 1) Since distributed immobilization of the hygroscopic resin excellent in the moisture absorption property is carried out into the fibrous base material, a moisture absorption/desorption rate is remarkably early.

[0026] 2) after moisture absorption -- liquid -- there is who [ no ] and don't wet a perimeter

[0027] 3) Since it is fabricated in the shape of a sheet, it is easy to deal with it, and can stick, or can be used also as an wrapping material.

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[Translation done.]